Effect of Administration of Extract from *Coprinus Comatus* on Skin Inflammation induced by UV-B Irradiation

Xiaohong Wu³, Hiroshi Shimoda⁴, Yoji Kato⁵, Shinsuke Hisaka⁶, Etsuko Harada⁷, Tomomi Ito⁸, Toshihiko Osawa⁹

³HealthCare Systems Co. Ltd., ⁴Oryza Oil & Fat Chemical Co. Ltd., ⁵School of Human Science and Environment, University of Hyogo, ⁶Faculty of Pharmacy, Meijo University, ⁷Iwade Research Institute of Mycology, ⁸Hokkaido University of Education, ⁹Aichi Gakuin University

Abstract

*Coprinus comatus* is an edible mushroom and contains high amount of ergothioneine, which is a naturally occurring amino acid with strong antioxidant activity, anti-photoaging and anti-inflammatory effect. In this study, we examined the inhibitory effects of the extract of *coprinus comatus* on inflammatory responses in mice skin exposed to UV-B.

Introduction

**Scientific Classification of Coprinus Comatus**

- Class Agaricomycetes
- Order Agaricales
- Family Agaricaceae
- Genus *Coprinus*

**Coprinus Comatus**

- Contains high amount of Ergothioneine
- Have scavenging ability on DPPH radicals, hydroxyl radicals, superoxide radicals

Ergothioneine

- Naturally occurring amino acid
- Can not be synthesized in the human cells
- Upon absorption, it distributes in the erythrocytes, lens of eyes and skin
- Antioxidant activity is stronger than ascorbic acid

Method-1 (*in vivo*)

**Design of Animal Experiment**

- Solar simulator
- 60 days
- Control
- Group 1: UV B(-), *Coprinus extract(-)
- Group 2: UV B(+), *Coprinus extract(-)
- Group 3: UV B(+), *Coprinus extract(+)

**Haematoxylin and Eosin Staining (HE)**

- Dorsal skin removed from UV-B irradiated mice (6mm × 6mm)
- Fixed in 4% formaldehyde

**Histopathologic changes**

- The thickness of epidermis was increased in UV irradiated mice and was reduced by oral administration of *coprinus comatus* extract (see Fig. 1)
- Neutrophils were accumulated in the dermis in UV-irradiated mice (see Fig. 2)

**Immunohistochemical Detection**

- Positive immunostainings for MPO and 8-BrdG were observed obviously in dermis compared to non-irradiation control (Fig. B, E)
- Administration of extract resulted in reduction of the staining in dermis (Fig. C, F)

Result-1 (*in vivo*)

**UV-B(−)**

- UV-Body

**UV+ B+ coprinus extrac**

- Dorsal skin- fixed in 4% paraformaldehyde

**Result-2 (*in vitro*)

**Anti-MPO Activity Evaluated by Method-2**

- The inhibitory rate of MPO activity of *coprinus comatus* is the highest among the four mushrooms examined. It is shown that the inhibitory rate of MPO activity is correlated with the content of ergothioneine.

**Inhibitory Effect of Coprinus Extract in 8-BrdG Formation Evaluated by Method-2**

- It is shown that coprinus extract as well as ergothioneine inhibited halogenation of dG in a dose-dependent manner.
- Under the same concentration, the inhibitory rate of 8-BrdG formation of ergothioneine was 2.1-fold higher than that of glutathione, and 1.8-fold higher than that of ascorbic acid.

Conclusions

Although the study regarding metabolism of *coprinus comatus* *in vivo* still remains to be examined, these results suggest that the extract of *coprinus comatus* may protect the skin from UV-B induced inflammation, which causes DNA halogenation, through the inhibitions of MPO activity directly and scavenging on halogenous species.